

16. A composition of matter as claimed in Claim 15 wherein said dispersing of said solution is in a first direction and said bath gas is directed in counter current direction to said first direction.

17. The composition of matter according to Claim 14 wherein said dispersing of said solution occurs in the presence of an electric field.

18. The composition of matter of claim 15 wherein said bath gas is at approximately atmospheric pressure.

19. The composition of matter of claim 14 wherein said polyatomic parent molecular species is selected from the group consisting of proteins, peptides, nucleic acids, and carbohydrates.

20. The composition of matter of claim 14 wherein said polyatomic parent molecular species is selected from the group comprising carbohydrates, polypeptides, proteins, polynucleotides and synthetic polymers.

21. A composition of matter comprising a population of ions comprising a plurality of sub-populations of multiply charged ions derived from a sample substantially comprising a single polyatomic parent molecular species, each molecule of said polyatomic parent molecular species having substantially the same molecular weight, each of said sub-populations characterized by ions having the same number of charges, a first sub-population of said ions having a minimum number of charges greater than two,

a second sub-population of said ions having a maximum number of charges not less than five, and, for each of every possible integral number between said minimum and maximum number of charges, sub-populations of ions, each having said integral number of charges.

22. The composition of matter according to Claim 21 generated by a process comprising the step of dispersing in the presence of a strong electric field a solution of said polyatomic parent molecular species in a volatile solvent as highly charged droplets into a gas at substantially atmospheric pressure wherein said solvent of said solution is vaporized from the droplets until at least some of said polyatomic parent molecular species becomes dispersed in said gas as said charged ions.

23. A composition of matter comprising a population of multiply charged ions derived from a polyatomic parent molecular species, each molecule of said polyatomic parent molecular species having substantially the same molecular weight, the number of charges on each of said ions defining that ion's charge state number, said population of ions comprising a plurality of sub-populations, one for each of every charge state number whose minimum value is greater than 2 and a maximum value not less than 5, said population generated by dispersing a solution of said polyatomic parent molecular species in a volatile solvent as highly charged droplets into a bath gas at approximately atmospheric pressure, and vaporizing said solvent from said droplets until at least some

of said parent polyatomic molecular species becomes dispersed in said bath gas as said multiply charged ions of said population .

24. The composition of matter of claim 23 wherein said minimum charge state number is not less than 8 and said maximum charge state number is not less than 12.

25. The composition of matter of claim 23 wherein said minimum charge state number is not less than 5 and said maximum charge state number is not less than 12.

26. The composition of matter of claim 23 wherein said polyatomic parent molecular species is selected from the group comprising bio-polymers.

27. The composition of matter of claim 23 wherein said polyatomic parent molecular species is selected from the group comprising proteins, peptides, nucleic acids and carbohydrates.

28. The composition of matter of claim 23 wherein said polyatomic parent molecular species is selected from the group comprising sugars, polynucleotides, and synthetic polymers.

29. A composition of matter derived from a sample substantially comprising a single polyatomic parent molecular species, all molecules of said parent molecular species having substantially the same molecular weight, comprising a population of multiply charged ions for which the mass spectrum is characterized by a sequence of not less than three peaks, each peak corresponding to a discrete sub-population of multiply

charged ions, each of said multiply charged ions having a ^{discrete} distinct integral number of charges greater than two, the multiply charged ions of each peak in said sequence differing from those of adjacent peaks by one charge.

30. A composition of matter comprising at least two populations of multiply charged ions generated from a sample comprising at least two distinct polyatomic parent molecular species, all of the molecules of each of said distinct polyatomic parent molecular species having substantially the same molecular weight, the number of charges on each ion defining the ion's charge state number, each of said populations of ions comprising a plurality of sub-populations, and, for each of said populations, there being one of said sub-populations for each of every possible charge state number whose minimum value is greater than two and a maximum value not less than five.

31. The composition of matter according to Claim 30 generated from a solution containing said at least two distinct polyatomic parent molecular species in a volatile solvent by dispersing said solution as highly charged droplets into a bath gas, allowing said solvent to vaporize from said droplets until at least some of at least two of said solute species become dispersed in said bath gas as said multiply charged ions.

32. The composition of matter according to Claim 31 wherein said dispersing of said solution occurs in the presence of an electric field.

33. The composition of matter according to Claim 31 wherein said bath gas is at approximately atmospheric pressure.

34. The composition of matter according to Claim 31 wherein said bath gas is directed in counter current direction to said dispersing of said solution.

35. The composition of matter according to Claim 30 wherein said minimum value of said charge state number is not less than 8 and said maximum value of said charge state number is not less than 12.

36. The composition of matter according to Claim 30 wherein said minimum value of said charge state number is not less than 5 and said maximum value of said charge state number is not less than 9.

37. The composition of matter according to Claim 30 wherein said polyatomic parent molecular species are selected from the class of compounds known as biopolymers.

38. The composition of matter according to Claim 30 wherein said polyatomic parent molecular species are selected from the group comprising proteins, peptides, nucleic acids and carbohydrates.

39. The composition of matter of Claim 30 wherein said polyatomic parent molecular species are selected from the group comprising carbohydrates, polypeptides, proteins, polynucleotides, and synthetic polymers.

40. The composition of matter as claimed in Claim 14, wherein said polyatomic parent molecular species does not comprise oligomers of the same monomer.

41. The composition of matter as claimed in Claim 30, wherein said polyatomic parent molecular species does not comprise oligomers of the same monomer.

42. The composition of matter as claimed in Claim 14, wherein said polyatomic parent molecular species does not comprise polyethylene glycol.

43. The composition of matter as claimed in Claim 30 with the proviso that said polyatomic parent molecular species not comprise polyethylene glycol.

44. A composition of matter comprising a plurality of populations of ions comprising sub-populations of multiply charged ions derived from a sample comprising two or more distinct polyatomic parent molecular species, each molecule of each of said distinct polyatomic parent molecular species having substantially the same molecular weight, ^{first} a sub-population of ions for each distinct polyatomic parent molecular species characterized by ions having the same minimum number of charges, greater than two; a second sub-population of ions for each distinct polyatomic parent molecular species

characterized by ions having the same maximum number of charges, not less than five, and additional sub-populations of ions for each distinct polyatomic parent molecular species, for each possible integral number between said minimum and said maximum, each ion of said additional sub-populations having said integral number of charges.

45. The composition of matter as claimed in Claim 44 generated by a process comprising the steps of dispersing said solution containing said two or more distinct polyatomic parent molecular species and a volatile solvent as highly charged droplets into a bath gas, allowing said solvent to vaporize from said droplets until at least some of at least two of said distinct polyatomic parent molecular species becomes dispersed in said bath gas as said multiply charged ions.

46. The composition of matter as claimed in Claim 44 wherein at least one of said distinct polyatomic parent molecular species is selected from the group comprising bio-polymers.

47. The composition of matter as claimed in Claim 44 wherein at least one of said distinct polyatomic parent molecular species is selected from the group comprising proteins, peptides, nucleic acids, carbohydrates, sugars, polynucleotide, and synthetic polymers.

48. The composition of matter as claimed in Claim 44 wherein each of said distinct polyatomic parent molecular species do not comprise oligomers of the same monomer.

49. The composition of matter as claimed in Claim 44 wherein not all of said distinct polyatomic parent molecular species comprise polyethylene glycol and its oligomers.

50. A composition of matter derived from a sample comprising two or more distinct polyatomic parent molecular species, all molecules of each of said distinct parent molecular species having substantially the same molecular weight, said composition of matter comprising a population for each of said distinct polyatomic parent molecular species of multiply charged ions for which the mass spectrum is characterized by a sequence of not less than three peaks, each peak corresponding to a discrete sub-population of multiply charged ions, each of said multiply charged ions having a discrete integral number of charges greater than two wherein the multiply charged ions of each peak in said sequence for each distinct polyatomic parent molecular species differ from those of adjacent peaks by one charge unit.

51. A composition of matter comprising a population of ions, each ion in said population being characterizable by the symbol $M(C)$ wherein M stands for one molecule of a chemically distinct polyatomic parent molecular species from which said ion is derived and C represents the charge state of said ion,

102
103
104
said charge state being characterized by an integer equal to the number of charges on said ion,

said population of ions comprising one or more sub-populations, one population for each species of distinct polyatomic parent molecular species M from which at least some of said ions in said population have been derived,

said sub-populations for each distinct polyatomic parent molecular species M including at least some ions in each of every charge state C,

said charge states in said sub-populations including one charge state for each of every integral value of C whose minimum value is greater than 2 and a maximum value not less than 5.

52. A composition of matter as in Claim 51 wherein each ion of said population is derived from an individual molecule of a single chemically distinct polyatomic parent molecular species M, all of said individual molecules having substantially the same molecular weight.

53. A composition of matter as in Claim 51 in which the chemically distinct polyatomic parent molecular species is chosen from the class known as biopolymers.

54. A composition of matter as in Claim 51 in which the chemically distinct polyatomic parent molecular species is chosen from the class including peptides, proteins, carbohydrates, oligonucleotides and combinations thereof.

55. A composition of matter as in Claim 51 in which each molecule of said chemically distinct polyatomic parent molecular species has substantially the same molecular weight as all other molecules of said chemically distinct polyatomic parent molecular species.

56. A composition of matter comprising an ensemble of ions, said ensemble comprising at least one component population of multiply charged ions, each one of said multiply charged ions in said population being characterizable by the symbol ξ , the numerical value of ξ being the m/z value for said one of said multiply charged ions such that $\xi = M_r/i + m_a$ wherein M_r is the molecular weight of a distinct parent polyatomic molecular species from which all of said multiply charged ions in said component population are derived, i is an integer equal to the number of adduct charges attached to said distinct parent molecular species to form said multiply charged ion, and m_a is the average mass of said individual adduct charges on said multiply charged ion, said component population of ions comprising a plurality of subpopulations, the ions of each

3
i beginning with a minimum
possible integral value no less than 3 and extending to and including a maximum value equal to the minimum value plus an integer no smaller than three.

57. The composition of matter of claim 56 in which the minimum value of i is no less than 5 and the maximum value is an integer equal to the minimum value plus an integer no smaller than 4.

58. The composition of matter of claim 56 in which said distinct parent polyatomic molecular species is not a polymer of a single monomeric species.

59. The composition of matter of claim 56 in which said distinct parent polyatomic molecular species is chosen from the class of so-called biopolymers comprising peptides, proteins, glycoproteins, carbohydrates and oligonucleotides.

60. The composition of matter of claim 56 in which said distinct parent polyatomic molecular species is a protein.

61. The composition of matter of claim 56 in which said distinct parent polyatomic molecular species is an oligonucleotide.

62. A composition of matter comprising an ensemble of multiply charged ions, each one of said multiply charged ions being characterizable by the symbol xi, the

numerical value of x_i being the m/z value for said one of said multiply charged ions such that $x_i = M_r/i + m_a$ wherein M_r is the molecular weight of a distinct parent polyatomic molecular species from which said one of said multiply charged ions is derived, said distinct parent polyatomic molecular species not being the polymer of a single monomeric species, i is the number of adduct charges attached to said parent polyatomic molecular species to form said one of said multiply charged ions, m_a is the average mass of the said adduct charges on said one of said multiply charged ions;

(i) said ensemble of multiply charged ions comprising at least two component populations of multiply charged ions, the ions of each of said component populations of multiply charged ions having the same value for M_r , said value of M_r being different for each of said component populations;

(ii) each of said component populations of multiply charged ions comprising a plurality of subpopulations, the ions of each of said sub-populations having the same values for i and m_a , said plurality of said sub-populations comprising at least one subpopulation for each possible integral value i beginning with a minimum value no less than three and extending to a maximum value equal to the minimum value plus an integer no smaller than 3; and

(iii) said plurality of said component populations including at least one sub-component population that contains a sub-population in which the minimum value of i is at least 3.

63. The composition of matter of claim 62 in which at least one of said component populations contains a sub-population in which the minimum value of i is at least 5.

64. The composition of matter of claim 62 in which at least one of said distinct parent polyatomic molecular species is chosen from the class of so-called biopolymers comprising peptides, proteins, glycoproteins, carbohydrates and oligonucleotides.

65. The composition of matter of claim 62 in which at least one of said distinct parent polyatomic molecular species is a protein.

66. The composition of matter of claim 62 in which at least one of said distinct parent polyatomic molecular species is an oligonucleotide.--

REMARKS

Applicant has made minor corrections to the specification of the application to correct punctuation and minor syntax errors. The title has also been changed to more accurately define the invention. No new matter has been submitted.